19. A high-efficiency cladding pumping fiber laser apparatus comprising:
a laser fiber having cladding with its core doped with at least one active species,
at least one laser diode array module,
an imaging optical system,
wherein said imaging optical system is disposed between said laser diode module and an aperture of said laser fiber and focuses the beam from said module onto the aperture of said laser fiber; and wherein said laser diode array module comprises at least one laser diode array with a beam having fast and slow axis divergence, a collimating structure, and an optical relay system; and wherein said optical relay system has at least one optical element for beam relay and is disposed between said laser diode array and said laser fiber, whereby the laser beam from said laser diode array is relayed to a more distant point with the beam spot dimension being kept substantially unchanged.

20. An apparatus of claim 19, wherein said laser fiber has a symmetry-broken inner cladding surrounding the core of said laser fiber.

21. An apparatus of claim 19, wherein said laser fiber has a multiple-imaging cladding surrounding the core of said laser fiber.

22. An apparatus of claim 20, wherein said symmetry-broken cladding is symmetry-broken circular cladding.

23. An apparatus of claim 20, wherein said symmetry-broken cladding is a symmetry-broken rectangular cladding.

24. An apparatus of claim 21, wherein said multiple-imaging cladding is rectangular-like multiple-imaging cladding.

25. An apparatus of claim 19, wherein said optical relay system is a cylindrical lens.

26. An apparatus of claim 19, wherein said optical relay system is a 1:1 4f cylindrical relay.

27. An apparatus of claim 19, wherein said optical relay system is a non-1:1 cylindrical telecentric relay.

28. An apparatus of claim 19, wherein said collimating structure includes a plurality of fold prisms.

29. A high-efficiency diode-pumped solid state laser apparatus comprising:
a laser rod doped with active species,
at least one laser diode array module,
an imaging optical system,
wherein said imaging optical system is disposed between said laser diode module and an aperture of said laser rod and focuses the beam from said module onto the aperture of said laser rod; and wherein said laser diode array module comprises at least one laser diode array with a beam having fast and slow axis divergence, a collimating structure, and an optical relay system; and wherein said optical relay has at least one optical element for beam relay and is disposed between said laser diode array and said laser rod, whereby

the laser beam from said laser diode array is relayed to a more distant point with the beam spot dimension being kept substantially unchanged.

30. An apparatus of claim 29, wherein said optical relay system is a cylindrical lens.

31. An apparatus of claim 29, wherein said optical relay system is a 1:1 4f cylindrical relay.

32. An apparatus of claim 29, wherein said optical relay system is a non-1:1 cylindrical telecentric relay.

33. An apparatus for laser beam transmission comprising:
an optical fiber for laser beam transmission,
at least one laser diode array module,
an imaging optical system,
wherein said imaging optical system is disposed between said module and an aperture of said optical fiber and focuses the beam from said module onto the aperture of said optical fiber; and wherein said laser diode array module comprises at least one laser diode array with a beam having fast and slow axis divergence, a collimating structure, and an optical relay system; and wherein said optical relay has at least one optical element for beam relay and is disposed between said laser diode array and said optical fiber, whereby the laser beam from said laser diode array is relayed to a more distant point with the beam spot dimension being kept substantially unchanged.

34. An apparatus of claim 33, wherein said optical relay system is a cylindrical lens.